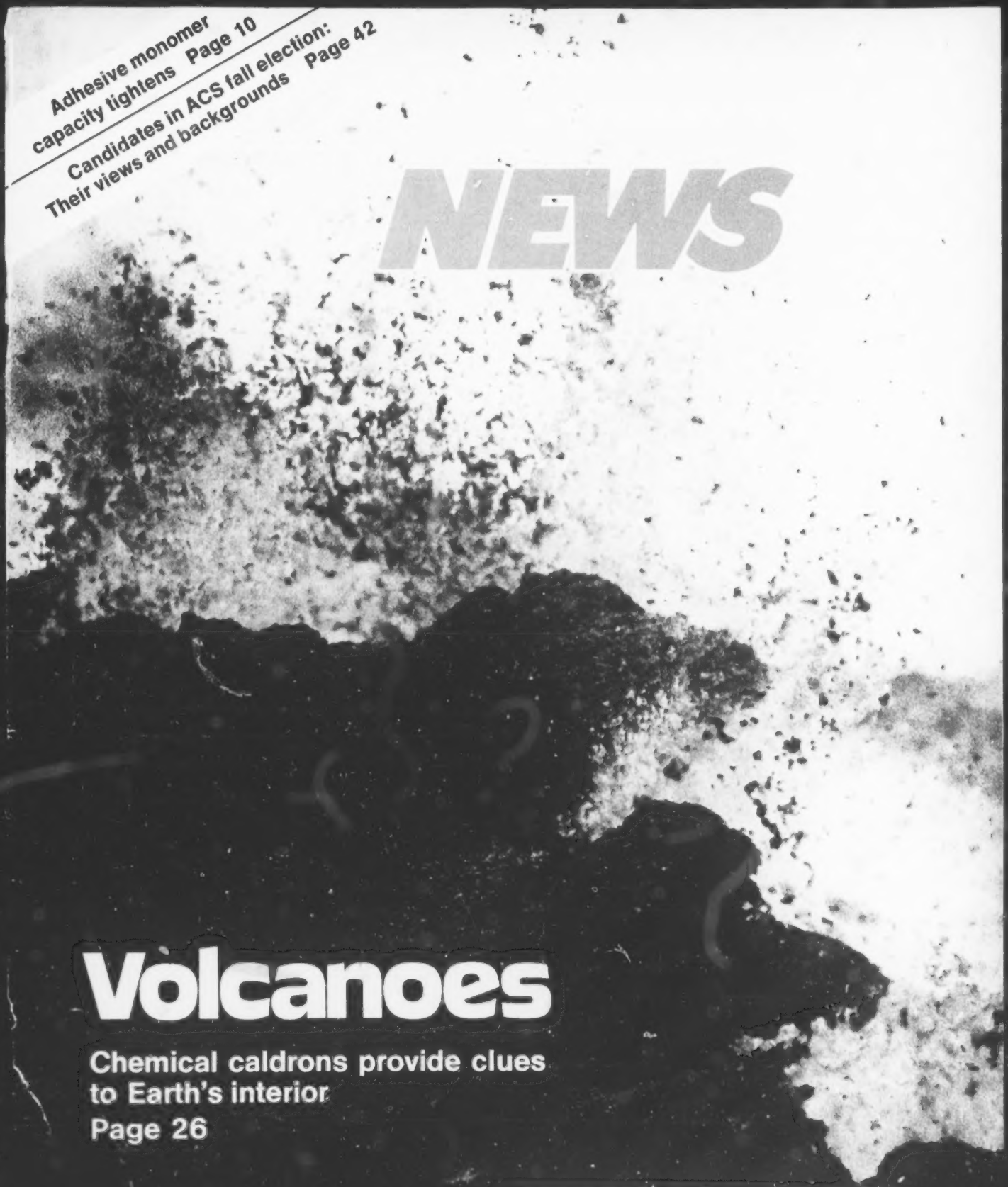
Adhesive monomer capacity tightens Page 10

Candidates in ACS fall election: Their views and backgrounds Page 42

NEWS



Volcanoes

Chemical caldrons provide clues to Earth's interior

Page 26

0511179C094 9 h AR623SSL 1
CONGRESSIONAL INFO SERV-SRI
4520 EAST WEST HWY SUITE 800
SRI ACQUISITIONS
BETHESDA MD 20814

CHEMICAL & ENGINEERING
NEWS
Volume 62, Number 39
CENEAR 62 (39) 1–72
ISSN 0009-2347
SEPTEMBER 24, 1984

News of the Week

■ **Du Pont chairman calls for firming of government regulations on industrial uses of biotechnology at opening of company's life sciences research complex.** **Page 6**

■ **InterNorth will acquire Texaco's Chemplex unit.** **Page 7**

■ **FDA okays the use of Monsanto's acrylonitrile/styrene bottle for nonalcoholic beverages.** **Page 7**

■ **Proposed West European academy of scientists would provide forum for deliberating science-related topics.** **Page 7**

■ **Union Carbide and McGraw-Edison set up joint venture to remove PCBs from transformers.** **Page 8**

■ **New weed killer acts through photosensitivity.** **Page 8**

Cover: Lava fountains from eruption of Mauna Loa volcano, Hawaii, March 26, 1984. Photo by USGS's James D. Griggs

Letters 4
Editor's Page 5

Concentrates
Business 9
Government 15
Science/Technology 18

The Departments
ACS News 24
Meetings 57
Newscripts 72

Business

Demand for organic intermediates phenol and vinyl acetate nears capacity, which may lead consumers to rely on imports. **Page 10**

International Business

West European chemical producers are enjoying higher earnings, in part because of continued strength of the U.S. dollar. **Page 14**

Government

OTA study suggests slowing down pace of Superfund cleanup, waste-end tax for funding, but Congress isn't interested. **Page 16**

Technology

Potential new markets for lignin in adhesives, foams, and plastics result from advanced techniques to study its structure. **Page 19**

South Korean fertilizer industry must innovate technologically if it is to regain competitiveness in world markets. **Page 21**

Chemical sensor based on a chemical modifying the properties of an optical sensing element developed at Sandia labs. **Page 22**

Study of formation of carbon-carbon bonds in methanol in presence of metal acetylides adds to research in isosynthesis. **Page 23**

ACS Election

Candidates for ACS president-elect, directors for Region III and Region VI, and director-at-large present platforms. **Page 42**

Special Report

Volcanoes—from the violent erupters like Krakatoa to the gentler effervescers like Kilauea—are intriguing studies for geochemists. **Page 26**

Phenol, Vinyl Acetate Face Tightening Supply

As demand increases, plants for producing these organic intermediates are operating at near capacity this year; users may have to turn to imports

Bruce F. Greek, C&EN Houston

A continuing upturn in demand for two important organic intermediates—phenol and vinyl acetate—for making adhesives and coatings has brought plants making these two chemicals to the limit of their capacity. With these plants operating at top rate, if demand continues to rise, more capacity may have to be added—possibly through debottlenecking and restarting some shutdown production units. Otherwise, consumers may have to rely more on imports.

With the increased demand for both phenol and vinyl acetate plus full utilization of capacity, substantial price increases also might have been expected. But although prices have increased some, the increases have been only modest and certainly not large enough to encourage producers to build additional capacity to make these materials.

Prices haven't increased any more, largely because consumers have the upper hand in negotiations as a result of stiff competition from other materials. Consumers are bargaining with producers on prices, emphasizing that producers' raw material costs apparently have declined. Benzene, ethylene, and propylene have list prices below year-ago levels. Energy prices also have remained steady or declined, so processing costs probably are not much higher if at all. Process improvements should have offset increases in other components of production cost.

Key Chemicals

But despite increasing demand, competition in end uses remains strong for phenol and vinyl acetate. For example, acrylic materials for making water-based paints remain very competitive with vinyl acetate even with considerable improvement in the vinyl acetate polymers offered in the paint field. This gives consumers of the two products considerable clout in price negotiations.

Because producers must keep the cost of the monomers as low as possible (too low for reinvestment size profitability, according to producers), demand for these materials remains strong enough to hold plant operating rates at a level where modest profits can be made.

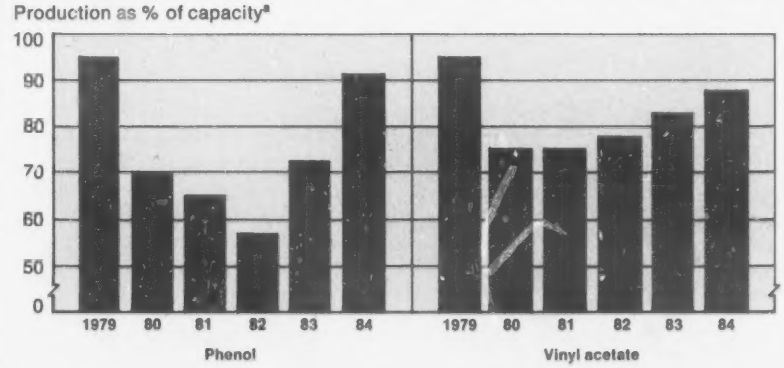
Additional capacity clearly seems to be needed, however, if production of these materials is to expand. Forecasts for growth in demand for phenol and vinyl acetate fall in line with forecasts for that of most major volume organic chemicals now—3 to 5% per year until 1990. At an average rate of 4% annual growth, roughly a one-third increase in production would be expected. Neither phenol nor vinyl acetate capacity now exists to permit that much additional production.

For new capacity to be added, at least two years' lead time is needed. Producers might get by without a large-scale plant for two years through debottlenecking, a slowdown in demand if there's another recession, and lower exports.

The most likely scenario for future capacity for phenol and vinyl acetate, according to various industry sources, will be a combination of some new capacity (mostly from debottlenecking), some restarting of shut-down capacity (possibly shifted to a new location), lower exports, and higher imports. Only if selling prices for these materials rise unexpectedly well will a new large-scale plant be built in the U.S. by the end of the 1980s.

For details of the near-term outlook for these two intermediates, please see the following pages.

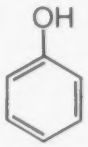
Production pushes capacity for intermediates near limits



a First-quarter nameplate capacity. **Sources:** International Trade Commission, industry and C&EN estimates

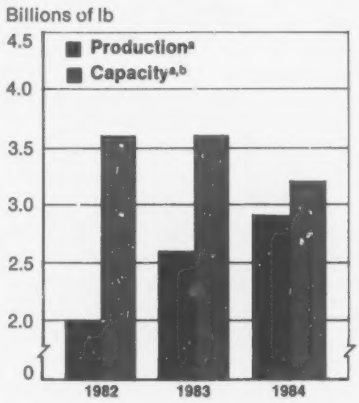
Key Chemicals

Phenol



- ***Demand higher***
- ***Capacity to rise***
- ***Prices up***

PRODUCTION/CAPACITY



a Synthetic only. b First quarter.

HOW MADE

Peroxidation of cumene (isopropyl benzene) and cleavage to phenol and acetone

MAJOR DERIVATIVES (U.S.)

Resins (mostly with formaldehyde as comonomer) 40%, bisphenol A 20%

MAJOR END USES (U.S.)

Adhesives 60%, plastics 20%

FOREIGN TRADE

Exports—to hold at about 100 million lb in 1984, imports—small and holding around 25 million lb

PRICES

List prices 36 to 39 cents per lb, discounts still significant

COMMERCIAL VALUE

$1 billion for production, 1984

This year phenol will join that small, but growing, group of organic chemicals whose excess capacity is about used up. Production of synthetic phenol in 1984 could exceed 3 billion lb, surpassing the 2.95 billion lb record set in 1979.

Since 1979, considerable changes have occurred for phenol. Nameplate capacity has continued to rise and exceeded 4 billion lb in 1981. Then following a severe decline in production during the recession to about 2 billion lb in 1982, capacity also dropped.

Monsanto is the latest to leave the phenol business, dropping 500 million lb from the 1983 capacity list. Minor debottlenecking offset a part of this shutdown capacity, but the current total, at about 3.2 billion lb, will be strained if 3 billion lb of phenol are produced in 1984.

Even if production falls a little short of the 1979 high this year, the average operating rate for plants on stream as the year began will be 90% for all of 1984. But some help is coming. By the end of this quarter, Georgia-Pacific will be putting some 157 million lb of capacity on stream in a plant that has been shut down for several years.

Additional debottlenecking is going on as well, which will add a bit to phenol capacity and help the snug supply. These small expansions could total between 100 million and 200 million lb when added up by the end of 1985.

List prices for phenol have risen so far in 1984 and some discounts have been taken off. This has helped to raise the previous low returns on sales of phenol and its derivatives. (Merchant sales account for about half of the production of phenol, although for some producers, sales are very small.) Considering current and expected returns on sales, producers still are unlikely to build new plants. A producer would require a large captive use to justify a plant, with any phenol for sale as incremental production.

Capacity additions by debottlenecking may be all that will be needed for several years. If 1984 production reaches 3 billion lb, it will be just 3.4% above the previous high. This tiny growth means that for the past five years production of phenol languished—hardly an incentive to build new capacity. Therefore, small capacity additions likely will be enough to get through 1985 when demand again might slow as the economy cools.

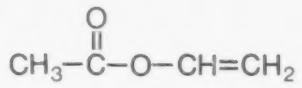
Exports, of course, are a potential outlet for additional product made in the U.S. Currently, exports of phenol probably will amount to about 100 million lb, about the same as last year. Exports could be reduced to meet internal demand, but exporters have some investment in special handling equipment for phenol on which they would like to keep earning some return. New foreign plants also could cut into exports.

Adhesives—particularly those made with formaldehyde—for the housing market account for a major share of the consumption of phenol. This market depends heavily on housing demand. But, even if housing demand slows next year and, in turn, demand falls for plywood made with phenol-based adhesives, enough demand remains in other phenol uses for it still to have a good year. Inventory changes in plywood have some influence on adhesive demand, which could cause temporary swings in phenol demand as plywood inventories are liquidated and then rebuilt quickly.

Other applications for phenol are much smaller, and many also are connected with housing and with auto production. They also are partly responsible for pushing phenol production to capacity limits this year, but they, too, would decline if the economy slows. After many poor years, the many uses are making a very good year for phenol.

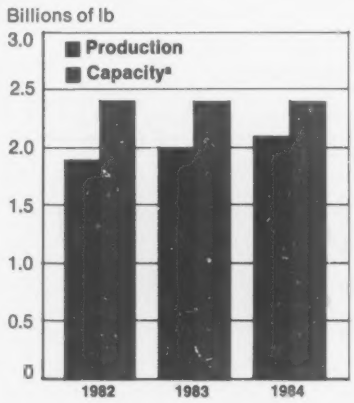
Key Chemicals

Vinyl Acetate



- ***Demand rising***
- ***Capacity tightening***
- ***Prices firming***

PRODUCTION/CAPACITY



a First quarter.

HOW MADE

Vapor-phase reaction of ethylene, acetic acid, and oxygen

MAJOR DERIVATIVES (U.S.)

Polymers 55%, polyvinyl alcohol 20%, copolymers 15%

MAJOR END USES (U.S.)

Adhesives 35%, paints 20%, paper and textile coatings 20%

FOREIGN TRADE

Exports—may decline slightly in 1984, but will exceed 500 million lb; imports—negligible

PRICES

List prices 34 to 39 cents per lb, discounts lessening

COMMERCIAL VALUE

$750 million for production, 1984

Vinyl acetate production in 1984 will increase modestly from last year. Strength in housing and in auto production, along with the general improvement in the economy, are behind this production growth.

However, vinyl acetate production growth will lag behind that for many other major-volume organic chemicals for two reasons. Probably the most important reason to producers is that demand held better during the recession than for many other chemicals. So its recovery has not been as dramatic. The second reason and the most important to customers is that not a great deal of excess capacity exists for vinyl acetate.

Vinyl acetate production this year likely will total at least 2.1 billion lb and may even reach practical effective capacity of 2.2 billion lb. That would mean that plants would run near effective capacity, or in the range of 87 to 91% of total nameplate capacity in place at the beginning of 1984.

Some small capacity additions are on the way. They probably will add about 100 million lb to the total when completed next year. As debottlenecking additions, they also will come on stream in small increments, making estimates of capacity difficult to pin down. The capacity expansions are partially dependent on additional capacity to make acetic acid, supply of which also has become relatively tight this year.

These additions will no more than meet additional demand for vinyl acetate expected in 1985, and possibly not even that. Any additional demand above that which can be produced by the existing and added capacity will be met by diversion of vinyl acetate from export markets. In 1984, the combination of the strong dollar and improving demand in the U.S. apparently will keep exports down from earlier levels.

Besides exports of the monomer, derivative exports also increase the total quantity of vinyl acetate exports. These polymers' exports individually are not large, but have added more than 100 million lb to the amount of vinyl acetate that eventually will be exported.

In the U.S., most of the major uses of vinyl acetate are increasing in volume at about the same rate under the push of the improved economy. Paints of various kinds will require about 4% more vinyl acetate as emulsions made with copolymers than last year. Interior paints still account for the majority of trade sale paints made of vinyl acetate copolymer emulsions, but exterior paints using vinyl acetate are gaining a bigger share as improvements develop in paint adhesion through use of various comonomers.

Adhesives compete strongly with paints for the title of being the largest end-use market of vinyl acetate. (Polyvinyl alcohol and other derivatives also eventually end up in adhesives.) Demand for adhesives containing vinyl acetate varies to some degree with the economy because a big share goes into packaging adhesives for boxboard and seam materials. With the strong economy, demand for vinyl acetate in this adhesives use is up 4 to 5% so far this year. Other kinds of adhesives based on vinyl acetate are smaller in volume, but together add up to another very sizable use of this monomer.

Other end uses such as paper coatings, textile sizes, polyvinyl butyral for auto safety glass laminates, and the many copolymer resins all are adding to vinyl acetate demand. And no matter what happens to the economy, demand for relatively recession-resistant vinyl acetate likely will remain strong into next year.

Even with this strong current demand, and with prospects for less decline during recessions, no large capacity additions will be available for quite some time. Thus, tight supply could remain a problem for vinyl acetate.